

Gastrointestinal Symptoms of Marathon Runners

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A survey of 707 participants in the 13th Annual Trail's End Marathon in Seaside, Oregon, showed a high incidence of gastrointestinal disturbances, predominantly of the lower tract, associated with long-distance running. The urge to defecate, both during and immediately after running, occurred in over a third of runners. Bowel movements (35%) and diarrhea (19%) were relatively common after running, and runners occasionally interrupted hard runs or races for bowel movements (18%) or diarrhea (10%). Lower gastrointestinal disturbances were more frequent in women than in men and in younger than in older runners. Awareness of the frequency and nature of gastrointestinal symptoms documented by this survey will assist physicians in evaluating abdominal complaints in runners.

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Jogging and running are popular forms of endurance exercise to achieve physical fitness, and participation in these activities has increased dramatically in recent years. The American College of Sports Medicine makes the following recommendations on the quantity and quality of training to develop and maintain cardiorespiratory fitness and body composition: frequency of exercise of three to five days a week, intensity at 60% to 90% of maximum heart rate reserve, duration of 15 to 60 minutes of continuous aerobic activity and any activity that uses large muscle groups.¹ Running is the most convenient exercise to achieve these goals and has introduced an increasing percent of the population to long-distance running, including the marathon. A recent comprehensive review of studies addressing metabolic and physiologic aspects of marathon running cites investigations involving most organ systems with the notable exception of the gastrointestinal (GI) tract.² Personal experience, numerous anecdotal reports from fellow runners (hoping a physician runner would be wise enough to prevent or at least explain their GI disturbances) and results of a small survey of members of a running club³ suggest that GI symptoms associated with running are common and may even include bloody diarrhea.^{4,5} To better document the frequency of GI disturbances experienced during or immediately after long-distance running, a questionnaire surveying GI symptoms was given to the 1,700 participants of the 13th Annual Trail's End Marathon in Seaside, Oregon.

Methods

A single-page questionnaire was included in the race packet of all entrants in the 13th Annual Trail's End Marathon, which took place at Seaside, Oregon, on February 27, 1982. Participants were told that the purpose of the survey was the collection of information from a large group of long-distance runners to better understand the effects of running on gastrointestinal tract function. Completed questionnaires were returned in accompanying self-addressed and stamped envelopes or left in a designated return box at the finish area.

The questionnaire addressed three areas: (1) demographic data, which included age, sex, years running and average weekly mileage; (2) baseline GI symptoms, which included the average number of daily bowel movements and the frequency of loose stools or abdominal cramps, and (3) symptoms associated with running, either during easy training runs (category A), during hard training runs or races (category B) or immediately after an easy or hard run (category C). Symptoms surveyed in each category included the upper GI tract symptoms of heartburn, nausea and vomiting, and the lower GI tract symptoms of abdominal cramps, urge to have a bowel movement, actual bowel movement, diarrhea and bloody bowel movement. Participants were asked to estimate the frequency of baseline and running-related GI symptoms by indicating whether each symptom occurred never, rarely, occasionally or frequently. Runners were also

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invited to provide anecdotal comments on the reverse side of the questionnaire.

For purposes of data analysis, a symptom was considered present (a positive response) when a respondent indicated "occasionally" or "frequently" and absent (a negative response) when "never" or "rarely" were indicated. To calculate the percent of respondents experiencing a given symptom, the "occasionally" and "frequently" responses were summed and divided by the total number of responses. Chi-square analysis was used to compare frequency of symptoms in each of the three running categories and differences between sex and age groups. Differences with a *P*-value equal to or smaller than .05 were accepted as statistically significant.

Results

Questionnaires were returned by 707 (41.6%) of the 1,700 participants in the Seaside marathon. Demographic data of the respondents are shown in Figures 1 and 2. Mean age of the respondents was 35.5 years, and nearly 90% were between ages 20 and 60 years, with ages 31 through 40 having the largest representation. Men constituted 85.5% of respondents. The weekly running mileage averaged 45.7 miles per week, and the mean number of years running was 5.9 years.

Responses to questions regarding baseline symptoms showed that 57% of respondents had one or less than one bowel movement daily, 30% had 2 bowel movements per day and 13% had three or more per day. Also, 15% had frequent and 45% occasional loose bowel movements, whereas only 2% had frequent and 16% occasional abdominal cramps.

The frequency of upper gastrointestinal tract symptoms experienced during or after running is displayed in Table 1. Heartburn was noted by 8.8% to 9.5% of runners and occurred significantly more often during than after running. Nausea and vomiting were significantly more common during hard runs or after running than during easy runs. Analysis of sex and age subgroups for each of these three

symptoms showed no significant differences except that women had nausea more often than men during both easy and hard runs.

Table 2 displays lower gastrointestinal tract symptoms associated with running. Abdominal cramps were more common during hard runs (19.3%) or after running (13.9%) than during easy runs (10.9%). The urge to have a bowel movement was equally as frequent in all three categories and experienced by over a third of respondents (36.4% to 38.6%). During easy or hard runs 16% to 18.4% of respondents had bowel movements occasionally or frequently, 8.2% to 10% had diarrhea and 1.2% to 1.8% had a bloody

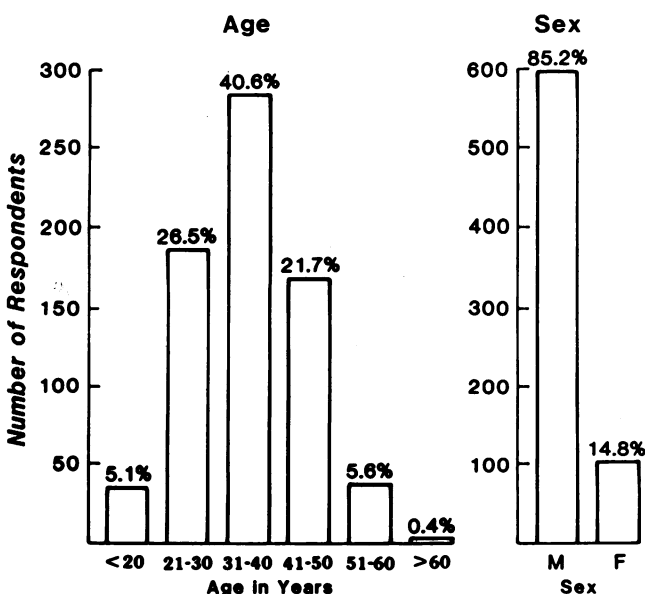


Figure 1.—Age and sex of the 707 respondents.

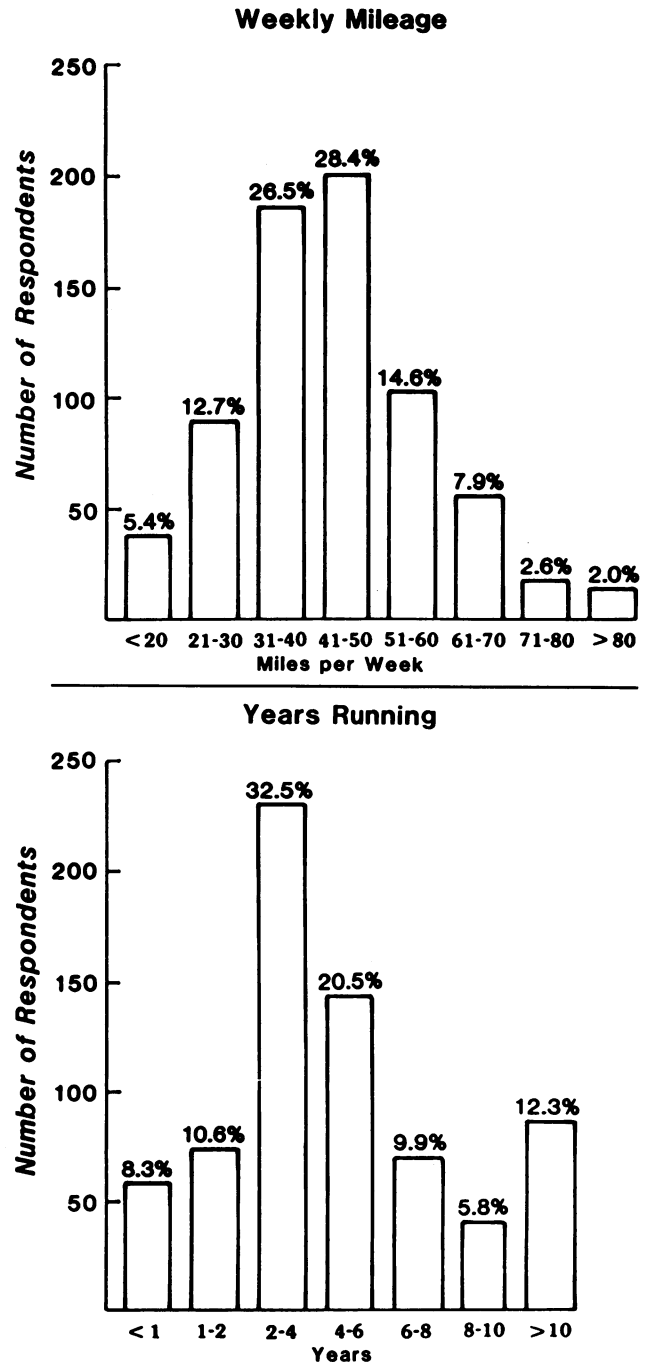


Figure 2.—Running experience of the 707 respondents.

TABLE 1.—Frequency of Upper Gastrointestinal Tract Symptoms in 707 Marathon Runners

Category	Symptom Present (Positive Response)* (% of total)		
	Heartburn	Nausea	Vomiting
A (easy run).....	8.8	1.8	0.3
B (hard run).....	9.5	11.6	1.8
C (after run).....	3.5	12.7	1.8

*Symptoms were considered present (a positive response) when the respondent indicated "occasionally" or "frequently" and absent when "never" or "rarely" were checked. Percent of positive responses was calculated by dividing the sum of "occasionally" and "frequently" responses by the total number of responses.

bowel movement. Each of these three symptoms was significantly more common after running, with 34.9% having a bowel movement, 19.2% having diarrhea and 2.4% having a bloody stool occasionally or frequently.

All lower GI tract symptoms were significantly more common in women in each of the three running categories

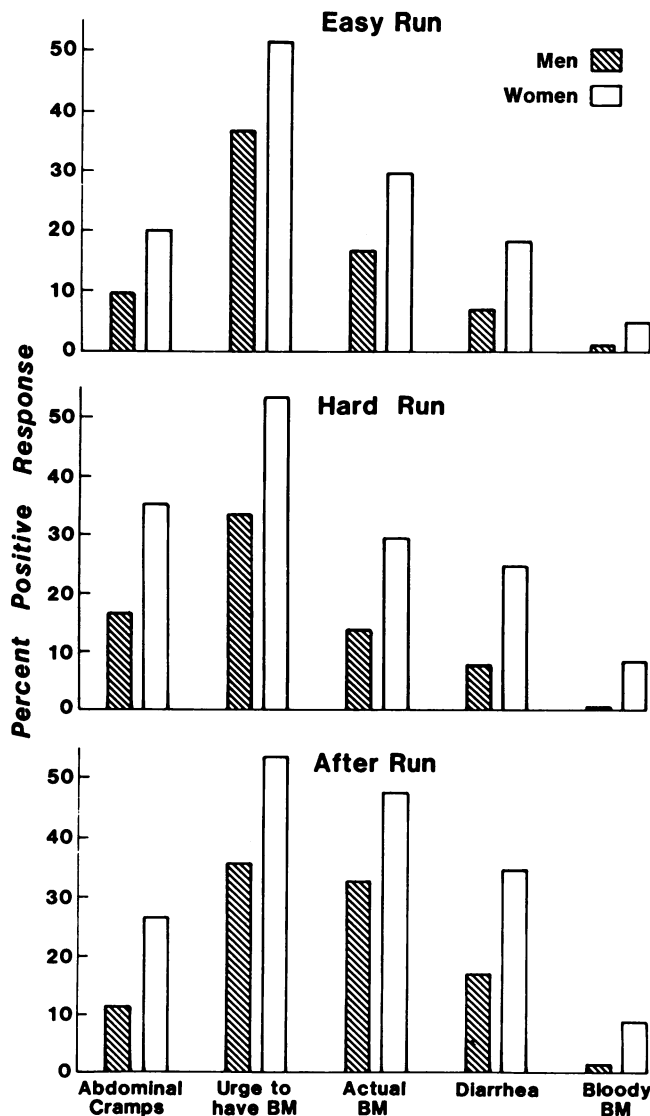


Figure 3.—Lower gastrointestinal tract symptoms in men and women. Bars represent the percent positive response (sum of "occasionally" and "frequently" responses divided by the total number of responses) for each sex. BM = bowel movement.

TABLE 2.—Frequency of Lower Gastrointestinal Symptoms in 707 Marathon Runners

Category	Symptom Present (Positive Response)* (% of total)				
	Abdominal Cramps	Urge to have BM	Actual BM	Diarrhea	Bloody BM
A (easy run).....	10.9	38.6	18.4	8.2	1.2
B (hard run).....	19.3	36.4	16.0	10.0	1.8
C (after run).....	13.9	38.2	34.9	19.2	2.4

BM = bowel movement

*Symptoms were considered present (a positive response) when the respondent indicated "occasionally" or "frequently" and absent when "never" or "rarely" were checked. Percent of positive responses was calculated by dividing the sum of "occasionally" and "frequently" responses by the total number of responses.

(Figure 3). When analyzed by age groups, there was a trend for all lower GI tract symptoms in each of the three running categories to be more frequent in runners younger than 20 years (N=36) than ages 20 through 40 (N=467) or age older than 40 years (N=204) (Figure 4). This higher frequency of symptoms in young runners was statistically significant for "abdominal cramps" in all three categories, "diarrhea" during easy runs, and "urge to have a bowel movement" and "actual bowel movement" after running (Figure 4).

Anecdotal comments, while not subject to scientific analysis, provided additional information not directly requested in the questionnaire. Of the total respondents 131 (18.5%) volunteered comments, the majority addressing timing of eating and bowel evacuation before running and general dietary recommendations. Avoidance of food two to five hours before running was suggested by 26 respondents, and 23 persons felt that a bowel movement before running reduced GI disturbances. Dietary habits were considered important by 58 respondents, but there was no consensus and often items recommended by some—such as bran, fruit, beer—were felt best avoided by others. Some runners thought that conditioning lessened GI disturbances. Many persons found the onset of abdominal cramps and urgency to be predictable after running a certain distance (two, four or ten miles). Finally, eight persons were pleased that running was a "natural laxative" and alleviated their chronic constipation.

Discussion

This survey documents a high incidence of gastrointestinal tract symptoms in long-distance runners and confirms our anecdotal impressions. The following conclusions emerge from the data:

- Lower GI tract symptoms are more commonly associated with running than upper GI tract complaints.
- The urge to defecate is the most common symptom experienced by runners (36.4% to 38.6%) and appears both during and immediately after running.
- Bowel movements (34.9%) and diarrhea (19.2%) are relatively frequent immediately after running.
- Runners need to interrupt runs for bowel movements (16% to 18.4%) or diarrhea (8.2% to 10%) not infrequently.
- 1.2% to 2.4% of runners have bloody bowel movements associated with running.
- All lower GI tract symptoms are noted more commonly by women than by men.

- Some lower GI tract symptoms (abdominal cramps during and after running and urge to defecate or actual bowel movement after running) are more commonly experienced by younger than older runners.
- Heartburn occurs more commonly during than after running, whereas nausea (11.6% to 12.7%) and vomiting (1.8%) are more troublesome during hard runs or after running.

Although the results of our survey are striking, we recognize potential problems with the usage of questionnaires. The 41.6% response rate (707 persons) provided information from a relatively large number of runners, but respondents may be more likely to have had GI symptoms than nonrespondents. On the other hand, the large number of respondents should dilute this bias. Many of the GI disturbances surveyed in the Seaside marathon runners are characteristic symptoms of the irritable bowel syndrome,⁶ and irritable bowel symptoms are reported in 13.6% to 17.1% of apparently healthy persons.^{7,8} It would be of interest to compare GI symptoms experienced by runners during nonath-

letic stressful events with those experienced during running. Personality, diet or other selection factors may result in a higher incidence of the irritable bowel syndrome in runners than in nonrunners. Finally, the use of the same questionnaire in a control nonrunning population and a population participating in an alternative form of aerobic exercise might better define the relative significance of our survey results in runners.

The pathophysiology of GI disturbances associated with running has not been studied and remains speculative. In spite of a resurgence of interest in physiologic investigations of marathon running, the GI tract has been neglected.² In one study subjects exercising on a treadmill had no differences in gastric emptying and intestinal absorption in comparison with baseline.⁹ By contrast, in a more recent study it was noted that exercise on a bicycle ergometer accelerated gastric emptying but had no significant effect on small bowel transit time.¹⁰ Increased serum gastrin has been associated with exercise.¹¹ Splanchnic, skin and renal blood flow are decreased during exercise while skeletal muscles receive a greatly increased percentage of cardiac output.¹² After a few minutes of continued exercise, intestinal arteries redilate by an "autoregulatory escape" mechanism, but mesenteric intestinal veins remain vasoconstricted.¹³ The role of these circulatory changes in the GI symptoms of long-distance runners is unknown, but relative gut ischemia is often postulated as a likely explanation.⁴ Gastrointestinal symptoms associated with running might also be explained by dietary factors, alterations in intestinal or colonic water and electrolyte fluxes, disturbances in GI motility or underlying irritable bowel syndrome. The physical pounding of running may induce physiologic events such as colonic mass movements that occur less often during other aerobic exercises such as cycling or swimming. The popularity of long-distance running and the frequency of GI disturbances documented by this survey invite future studies to explain these symptoms and to develop recommendations to reduce their occurrence.

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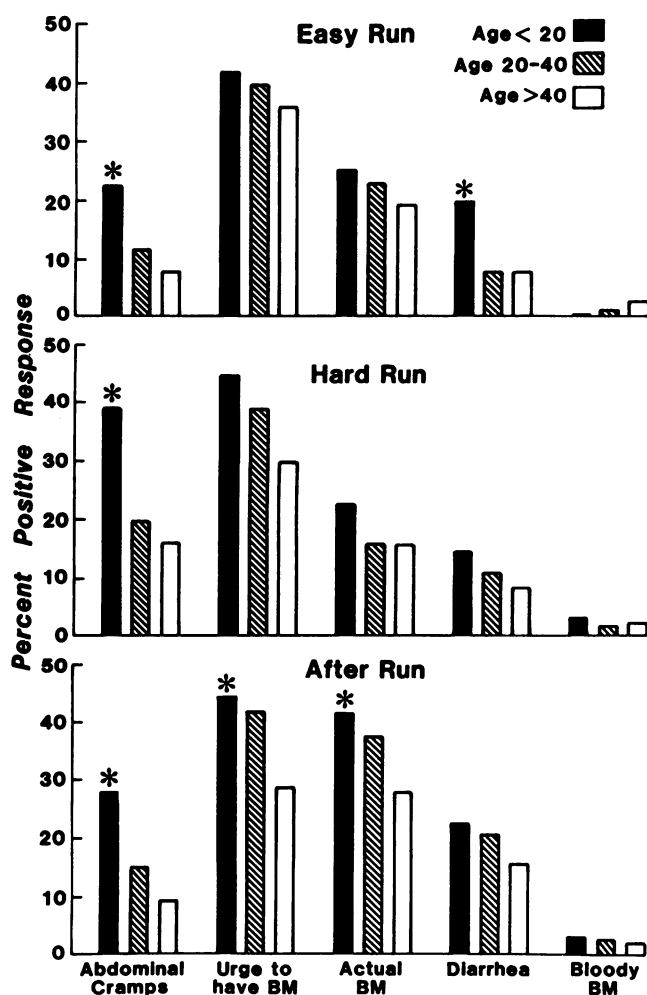


Figure 4.—Lower gastrointestinal tract symptoms in three age groups. Bars represent the percent positive response (sum of "occasionally" and "frequently" responses divided by the total number of responses) for age younger than 20, ages 20 through 40 and age older than 40 years. Asterisk (*) = statistically significant, comparing age younger than 20 with age older than 40 years. BM = bowel movement.